REPORT
ON THE PILOT PROJECT

" LEUKEMIA- LYMPHOMA "

QUARTER III

TASK 1. SAMPLING

Milestone 2.

(epidemiologic group)

During Quarter III an analysis was made of the State Registry data base concerning dosimetry data of the external exposure. Distribution of the clean-up workers according to the officially registered dose of external exposure recorded in the State Registry is presented in Table 1.

Table 1.

Distribution of the clean-up workers selected in the State Registry depending on the officially registered dose of external exposure involving all those registered.

Dose (sGy)	Year of participation in the clean-up work						unknown	Total
	1986	1987	1988	1989	1990	1986-1990		
2	3	4	5	6	7	8	9	10
до 5	4115	3985	10560	8514	2420	29594	16	296
5-14.9	7473	20737	3369	938	177	32694	7	327
15-24.9	21486	5479	114	34	4	27117	3	271
25-34.9	6941	411	26	13	1	7392	3	739
35-44.9	124	8	4	7	1	144	0	144
45-54.9	46	7	5	17	2	77	1	78
55-64.9	41	7	4	0	0	52	2	54
65-74.9	19	5	0	0	0	24	1	25
75-84.9	11	2	1	1	0	15	0	15
85-94.9	5	11	0	0	1	17	0	17
95-104.9	13	6	3	0	0	22	0	22
To 105	40274	30658	14086	9524	2606	97148	33	971
105 and more	99	22	16	6	4	147	1	148
Total	40373	30680	14102	9530	2610	97295	34	973
Unknown	57947	11948	3736	1557	642	75830	34853	110
Total	80548	61316	28172	19048	3252	173125	34887	208

So, according to the State Registry shown in Table 1 more than half of the clean-up workers registered have no records as to the individual dose exposure acquired during the clean-up work. Among the persons having such records 30.4 % acquired dose of up to 5 sGy; 33.6%-up to 15 sGy; 27.8%-up to 25 sGy; 7.6%-up to35 sGy; 0.15%-up to 45 sGy, 0.22% from 45 to 105 sGy, 0.15% -105 and higher. Thus, 91.9 % of the clean-up workers having records acquired individual dose of up to 25 sGy.

Milestone 4.

(epidemiologic group)

The Study Cohort file assemble and its support must be twofold involving technical and conceptual aspects.For technical support of the Cohort File assemble and its subsequent maintenance during Quarter III the epidomiologic group and specialists of the Ukrainian Center of Information Technologies and State Registry (UCIT&SR) have implemented technical facilities of the local area network on the site of UCIT&SR and integrated segment in the corporate network of the the Registry. During Quarter III the epidemiologic group received all the necessary equipment for technical support of the tasks stated in the Protocol.

To solve organizational problems of the cohort file assemble and its maintenance it was decided to locate the epidemiologic group and necessary facilities on the site of UCIT&SR which granted the required premises and took the responsibility for the maintenance of the epidemiologic group facilities.

The task of the epidemiologic group was to choose optimum option for arrangement of the local area network units to ensure maximum effectiveness in the automated information system functioning.

The task of the UCIT&SR was:

- to design, to lay and test the cable system;
- to mount and connect computer hardware.

Technical facilities of the local are network segment implemented to perform Quarter III involve

- cable system;
- hubs;

- local area network adapters;

- servers;

- stations.

The cable system was made using twisted pair technology and involves:

- outlets for connecting to the network of servers and stations- RJ-45 (14 units);

- cables to connect outlets and distribution patch panel;

- patch cords to commute distribution patch panel and hub ports -RJ-45 0.5 m (14 units);

- patch cords to connect outlets and network adaptors inserted into servers and stations RJ-45 3.0 (14 units);

- rack cabinets intended for installation of the distribution panels and hubs- 6U rack cabinet (2 units);

- protective boxes fixed on the walls for cord mounting.

Note: The mounting boxes (ESU2713- $2.37) for single Faceplate cat/5 (EWX-45-S1/5- 11.82), purchased by ComputerLand Co. do not fit the outlets dimensions and therefore, have not been mounted. Using twisted pair technology all cords and patch cords were made according to category 5 which guarantees:

- increased reliability of the data transmission in the cable system;

- carrying capacity of the cable system up to 100 Mbit/s.

The set of the hardware components purchased to carry out the Project ensures carrying capacity up to 10 Mbit/s.

The cable system was installed in USIT&SR in the premises as follows:

- room 404a, department 010 of the registry development;

- room 407, epidemiologic group;

- room 417, epidemiologic group.

The total length of the cable system is about 400 m. The scheme of the cable system and connection of the local area network elements are shown in Figs.1 and 2.

Figure 1 shows:

- location of the outlets and rack cabinets;

- protective boxes fixed on the walls with the cables connecting outlets and distribution panels;

- Fig.1 does not show the cables connecting outlets, servers and stations.

Figure 2 shows how local area network segments units are integrated to the Registry corporate network.

Hubs mounted in the rack cabinet in room 404a are connected using patch cords to the commutator which ensures coupling of the segment with the rest of the Registry network hardware.

All the working stations of the epidemiologic group located in the rooms 407 and 417 are connected with hubs.

Data bases servers of UCIT&SR and RCRM are connected with the commutator in the way to be readily accessible for the employees of the Registry stations to form and update the cohort data base.

Hubs.

Two Compag 1009 8-Ports 10Base-T, BNC Unmanaged Hubs have been installed into the local area network segment.

Local areas network adapters.

Local areas network adapters are included into the set of the servers and working stations supplies therefore, they are not considered separately in this report.

Servers.

Two Compaq Prosignia 200 6/233 M1 SCSI servers are installed in the local area network.

Stations.

Ten Compaq Deskpro 4000S DT 5200x2.1 CD-20 (32MB 256k S3 V2/2 W95 stations are installed into the local area network.

The complete list of the operations performed by UCIT&SR is given in Table 2.

A part of these operations stated in 6-9 was anticipated by the Computerland Co. The operations stated in 1-5 were not envisaged at all despite of the fact that they are compulsory to create the computer network. All the aforementioned operations were organized and performed by UCIT&SR using its own reserves and necessary specialists.

Therefore, a letter with the cost estimate is compiled to be sent to the Computerland Co. which is to reimburse for the expenses.

Subsequent operations to maintain functioning of the automated information system will involve:

- installation of the system software in the servers and working stations;
- organization of the working group of the local area network users;
- administrating of the network operating system .

Table 2.

Complete list and cost estimate of the operations performed by the UCIT&SR on intergrating segment of the local area network to the corporate network of the Registry to assemble, arrange and maintain the Cohort file.

№	Operation	Number	Price,hrn.	Sum, hrn.
1	Development of the cable system wiring diagram	1	200.00	200.00
2	Purchase of the necessary materials and equipment:			
2.1	Wall protective boxes , m	68	12.00	816.00
2.1	Cord UTP categorie 5, m	400	0.80	320.00
3	Construction operations:			
3.1	Punching holes for boxes	8	10.00	80.00
3.2	Drilling holes for fixing boxes	20	2.00	40.00
3.3	Drilling holes for fixing computer outlets	14	2.00	28.00
4	Instalation of the protective boxes, m	68	7.00	476.00
5	Cable line, m	400	2.50	1,000.00
6	Installation of the hubs	2	126.00	252.00
7	Installation and connecting of the outlets	14	31.50	441.00
8	Instalaltion and connecting of the distribution panel	14	21.00	294.00
9	Lines testing	14	31.50	441.00
	Total			4,388.00

Table 3.

Facilities received by the epidemiologic group during Quarter III according to the Protocol.

Items	Number
Paper Diamond Super Laser A3	8
Paper Diamond Super Laser A4	32
MINOLTA Page Pro 12 Toner Cartridge	8
Black Cartridge for HP 890C	32
MINOLTA Page Pro 6 Toner Cartridge	12
Colour Cartridge for HP 890C	32
Verbatim Blank Recordable CD media	10
4.0- Gigabyte DDS2 DAT Cartridge	6
Verbatim 3.5 Diskettes(10 units)	10
Toner for Minolta EP 1083 Copier	6
APC SurgeArrest e10	2
6U Rack cabinet.	2
Distribution panel	2
Patch Cord 0.5 m	14
Patch Cord 3.0 m	14
Surface Mounting box	14
Single Faceplate cat/5	14
Windows NT Server 4/0 Eng CD Rom	2
Office-97 32-Bit Windows Russian CD Rom	6
MT-2834ZDXI	2
DESKPRO 4000S DT 5200x2.1 G CDx20(32 MB, 256 k, s3,v2\2 W95)	10
Country Kit Russian for DP 4000	10
Keyboard RUSSIAN	10

Compaq 15' V55 Value Colour Monitor	10
Pro SIGNIA 200 6/ 233 M1 SCSI	2
Keyboard RUSSIAN	2
4.3 - Gb Wide -Ultra SCSI (1') Hard Drive	4
64-MB Memory Kit (2x32 MB , EDO DRAM, 60Ns, SIMM)	2
4/8- GB DAT Drive SCSI - 2	2
Compaq V40 Monitor , MRP, NH	2
HP DESKJET 890C printer	2
UPS T1000h (200-240 Volt\1000 Volt Amp)	9
Armada 1560D P166 3.0 Gb 16 MB 20xCD 12.1' CSTN	1
1009B 8-Port 10 Base-T, 1 BNC UNMANAGED Hub	2
MINOLTA FAX	1
MINOLTA Page Pro 6 *	1
MINOLTA Page Pro 12 (4 MB) *	2
MINOLTA Network * Network-adapter	2
PostScript Level II Card *	2
MINOLTA EP1083 Copier 18 ppm A3 *	2

Conceptually, while making provisions to assemble, arrange and maintain the cohort file, at previous stages of the Protocol performance, an information model of the system and partially, the data base structure with specification of the individual record items to be selected from the Registry data base had been designed (Tabl.4.)

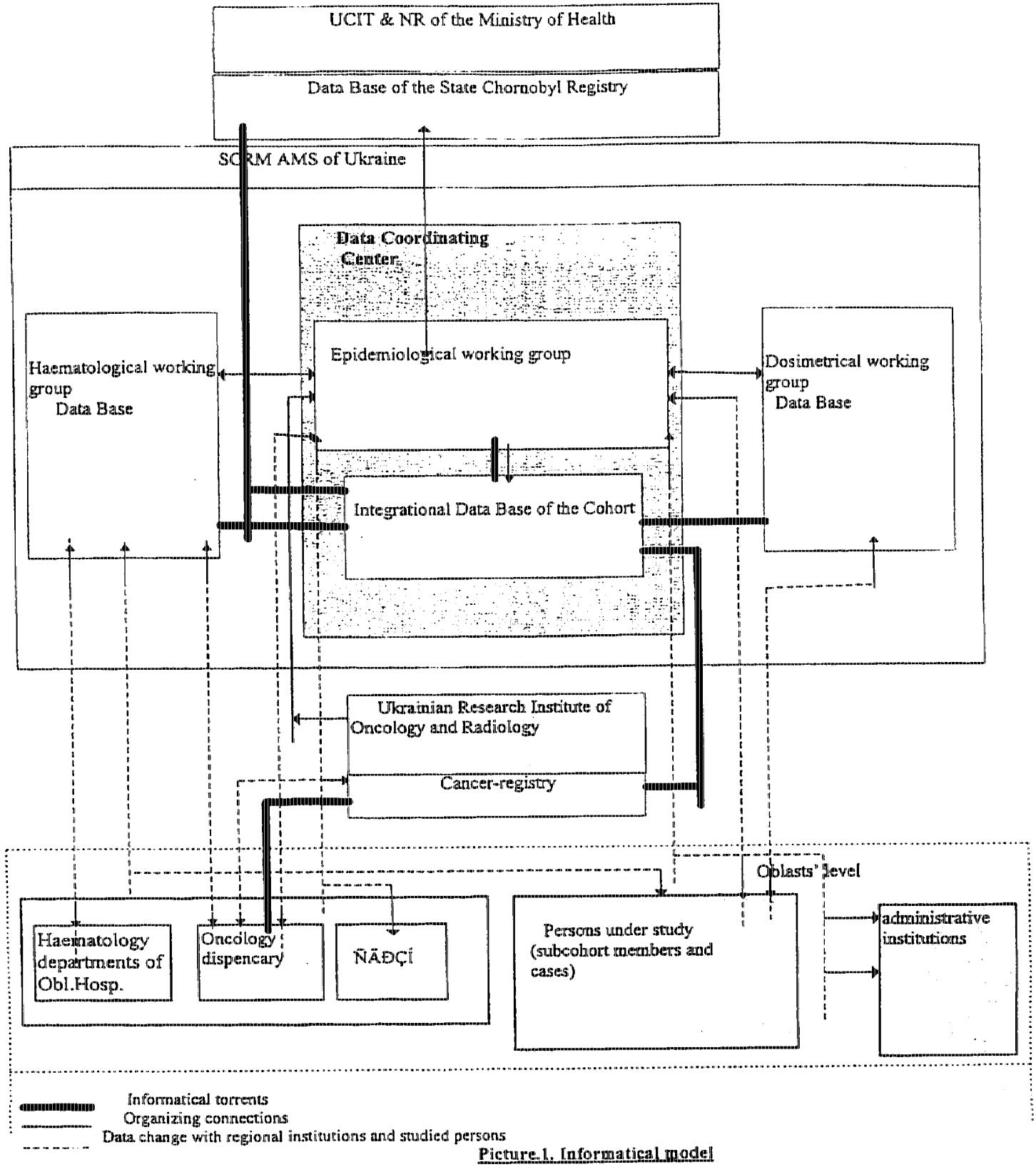
Table 4.

Structure of the information which will be selected for individual record of the cohort file in the State Registry Data Base

Semantics of Table	Semantics of Field
Main Registered informat	Systemic number
	Date of registration
	Date of departure
	ZKPO code
	Additional codeĚÍÓ
	District number
	Index card number
	Individual number
	Surname
	Name
	Patronymic
	Sex
	Date of birth
	Observation category
	Registration group
	Victim category
	Victim certification series
	Victim certification number
	Date sertification issued
	Office that issued the sertification
	Zip code of place of residence
	Oblast code of place of residence
	District code of place of residence
	Street, house, building, apartment
	Type of clinical examination and treatment in current year
Diagnoses of chronic illne were detected before 26.0 before the time of enterin	Systemic number
	Diagnoses code 1
	Diagnoses code 2
	Diagnoses code 3
	Diagnoses code 4
	Diagnoses code 5
Presence in the isolation z	Systemic number
	Zip code of nearest settlement
	Settlement
	Purpose for presence in zone

	Date entered zone
	Date left zone
Dosimetry data	Systemic number
	Thyreoid Dose Level
	External radiation dose
Code card	Systemic number
	ZKPO code on card
	Additional code on card
	District number on card
	Index card number on card
	Date the card filled out
	Card type - adult/child
	Invalidism group
	Date transferred to invalidism
	Diagnosis for transfer to invalidism
	Group of dispensary clinical and diagnostic service
	Date of death
	Cause of death
	Social group
	Field
	Profession
	Examination at Whole Body Counter (WBC)
	Diagnosis of illness 1, for which reason victim is under dispensary observ
	Diagnosis of illness 2 for which reason victim is under dispensary observa
	Diagnosis of illness 3 for which reason victim is under dispensary observa
	Diagnosis of illness 4 for which reason victim is under dispensary observa
	Diagnosis of illness 1 first detected in the current year and that which is u dispensry observation
	Diagnosis of illness 2 first detected in the current year and that which is u dispensry observation
	Diagnosis of illness 3 first detected in the current year and that which is u dispensry observation
	Diagnosis of illness 4 first detected in the current year and that which is u dispensry observation
	Diagnosis of other illness 1 first detected in the current year
	Diagnosis of other illness 2 first detected in the current year
	Diagnosis of other illness 3 first detected in the current year
	Diagnosis of other illness 4 first detected in the current year
	Influence of harmfactor 1
	Influence of harmfactor 2
	Influence of harmfactor 3
	Influence of harmfactor 4

The scheme in Fig.3 presents information model of the system allowing for the structures ensuring data entry.



Picture.1. Informatical model

Among the information objects forming structure of the system information model one should distinguish organizations of the state level, involving the Research Centre for Radiation Medicine of the Academy of Medical Sciences of Ukraine (RCRM of AMS); UCIT&SR, Ukrainian Research Centre of Oncology and Radiology (URCOR); those of oblast level, involving oblast hospitals, oncologic dispensaries, specialized dispensaries for radiation protection of the population (SDRPP), administrative authorities involving regional president's administrations, bureaus of lifetime events, municipal housing and communal offices as well as physical persons involving subcohorts members and those having leukemia or lymphoma.

The leading institution responsible for performance of the Project tasks is RCRM of AMS of Ukraine in which 3 working groups are formed involving epidemiologic, dosimetric and hematoloical ones in accord with the activities directions. The integrated data base (IDB) is designed, supplemented and maintained by the data coordinating centre organized on the basis of the epidemiologic group. This DB is based on the individual data in the DB of the State Registry of Ukraine concerning the passport-recording information on the persons included into the cohort (about 100 000 clean-up workers), on their stay in the isolation zone, and the dosimetry data as well as the results of the routine physical examinations in the post-accident period. Such information allows to control cases of leukemia in the cohort to follow-up the persons involved, to contact with them. The State Registry DB is maintained by UCIT&SR of the Ministry of Health of Ukraine where the data are verified and supplemented according to the results of annual physical examinations of the victims. The State Registry data on the persons selected for the cohort will be allocated in a separate DB of UCIT&SR to facilitate information exchange with the cohort IBD. Information as to the physical condition of the cohort members will be transferred annualy from the State Registry to IBD.

Taking into account different aspects of the study it is anticipated to manage specialized DBs in the dosimetric and hematologic groups, the generalized data being transferred to IBD.

The hematologic working group transfers the information as follows:

- data on the persons with the diagnoses of leukemia and malignant lymphoma to confirm their cohort member status and input verified information involving passport data,

diagnosis of the disease, date of the disease onset (date of hospitalization when the patient was first diagnosed), date of death;

- the list of the persons - members of the cohort hematologically examined with identified information involving passport data, system number in the IDB, list of medical examintions performed and their date.

The **dosimetry** working group transfers the dosimetry examination data on the clean-up workers- memebers of the cohort involving identified information (passport data, system number), dosimerty method, its results, date of examination, name of the institution which performed examination, expert estimate of the exposure dose received.

The **epidemiologic** group transfers to IDB:

- information gained as the result of personal contacts with the liquidators under surveillance involving idenfied data (surname, name, patronimic; system number), verified passport data, results of questionnaires, correspondence, etc;

- retrospective information on the cases of the diseases under study.

Enquiries as to the selection of the groups for physical examination, verification of the individual data for the persons under surveillance, generalized data etc. are directed from the working groups to the data coordinating centre. The enquiries are served by the employees of the data coordinating centre. The data to be verified and analysed by the experts will be directed from the data coordinating centre to the working groups.

A very significant source of information is the Ukrainian Cancer Registry maintained by the Research Institute of Oncology and Radiology.

Exchange of the data on the cases of leukemia and malignant lymphoma is anticipated with the Cancer-Registry. For this purpose linkage of IDB and Cancer-Registry data is likely to be carried out annually or twice a year. The list of the cohort members in the agreed form will be transferred to the Cancer-Registry to trace among them the persons with oncological diseases including leukemia and malignant lymphoma. Information on the leukemia cases detected during investigation will be directed from the data coordinating centre to the Cancer-Registry in the form of " Emergency report on case of cancer for the first time in the persons life reported (Form No.090/0).

Initial information on cohort members comes from regional institutions having legal (regional president's administrations), municipal (housing and communal offices), medical

(hematologic departments, oncological dispensaries) relations with the clean-up workers as well as from personal contacts with the clean-up workers involving interviews, routine physical examinations, correspondence, etc.).

Data acquisition from regional institution is feasible using both active (field work) and passive (from local staff) ways. Direct contacts with the clean-up workers may be the same. Information from the regional institutions and from the contacts with the clean-up workers is delivered to the working groups on the paper media and after verification and review by the experts it is directed to IDB in the data coordinating centre.

Thus, the structure of the information items comprising the domain has been outlined, data groups (objects) reflecting some vital parts of the domain have been singled out and interactions between the working groups responsible for the Protocol performance have been established.

Milestone 6.
(epidemiologic group)

During Quarter III the search for the " lost to follow-up " and revealing the causes for the absence of information on the routine physical examinations during three or more years was carried out with the help of the responsible physicians in the regional polyclinics according to the last known home address available. Mostly, these physicians have information on the long-term absence or change of the whereabouts of the clean-up workers under surveillance since it is usually revealed when they don't appear for routine physical examinations. As experience showed the head of the oblast dispensary department for medical support of the victims should be responsible for getting such information from the physicians (in the oblasts where there is a specialized dispensary for radiation protection of the population, it is the head of such institution). Such specialist is closely connected with the responsible physicians , supervises their work and is capable of the prompt decision-making under local conditions.The advantages above were clearly demonstrated in practice in Dnipropetrovsk by involvement in this work of the head of the dispensary department for medical support of the victims at the oblast clinical hospital.

Out of 50 persons randomly chosen from the " lost to follow-up " group:

- 9 persons moved up to the departmental subregistry of the railway transport workers. It is possible to get data on their physical condition, if necessary.

In 1994 in Dnipropetrovsk oblast 330 persons were trasferred from the State Registry to the depaartmental registry of the railway transport workers.

- 4 persons refused to come for the physical examinations.

- 2 persons had erroneous records in the Registry therefore, no data on the routine physical examinations have appeared in the Regisrty. The data registered were corrected. The data of 1998 examinations will be contributed to the Registry.

- 5 persons were examined by the physicians at the place of their occupation (at the medical units). As a result of economic difficulties encountered in Ukraine many enterprises stopped their business and the workers involving liquidators moved to the polyclinics in their residence area for the routine physical examinations. Only one of them was examined as a Chernobyl victim in the regional polyclinic, the data will be transferred to the Registry.

There are two ways of solving the problems concerning such liquidators, viz.,

1. Active contact of the responsible physician with the liquidator in the regional polyclinic;

2. Written invitation for the liquidator to get registred and have physical examinations.

- 8 persons have changed their residence and moved to another regional polyclinic. The causes for the absence of the routine physical examinations data are to be found out.

- 1 liquidator at present is in prison though his passport is registered and he is registered according to same address.

- 1 liquidator failed to confirm status of a liquidator therefore, he is not asked for examinations.

- 1 liquidator is registered in Dnipropetrovsk but actually he lives in the rural area in one of the districts of Dnipropetrovsk oblast.

- 1 liquidator regisered in Dniprodzerzhinsk emigrated to Israel. It is necessary to find out his home address at present.

- for 18 persons no data are ascertained.

The further strategy is to pursue the search with the help of the responsible physicians as well as via correspondence and possibly, telephone contacts with the liquidators. The text of the letter and questionnaire to respond will be compiled by the specialists of the RCRM and agreed with the local personnel. The letter will be signed by the head of the oblast dispensary department for medical support of the victims and will be sent to the liquidators' addresses.

TASK 2: DOSIMETRY

Milestone 9.

(dosimetric group)

During Quarter III the cards - responses to mini-questionnaires were still arriving back from clean-up workers-residents of the Dnipropetrovsk oblast. At present, 2,361 filled -in questionnaires from out of 6,444 letters sent have been received, 315 letters have not been delivered by postal service because of respondent's death or address change, so they have been returned. Time dependence of the response rate is presented in Fig.1 where both frequencies of card receipt and cumulative distribution are shown. As it is seen the highest income rate was observed on the tenth day after sending; and within a month we received the major part (80%) of the responses.

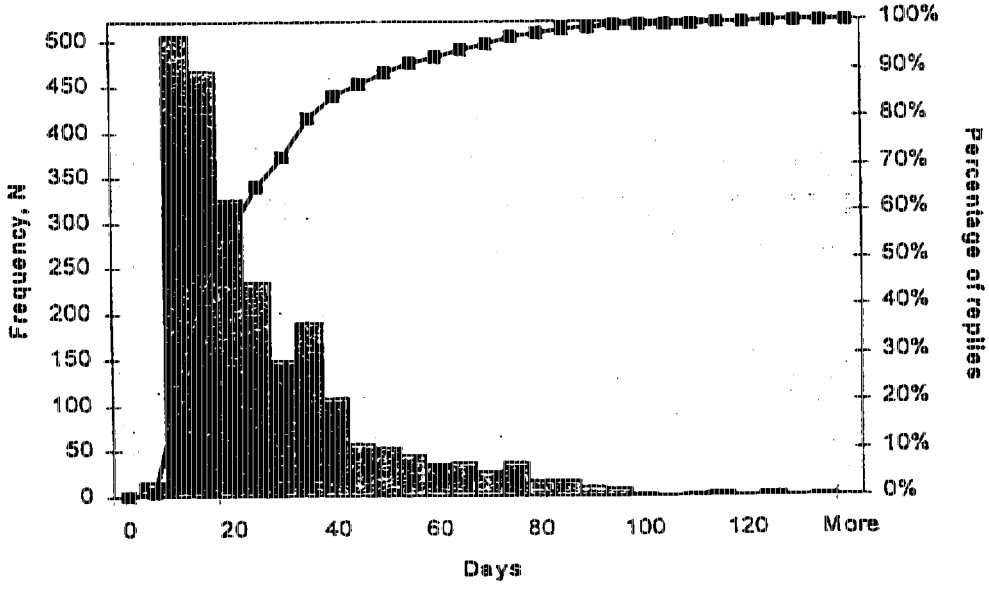
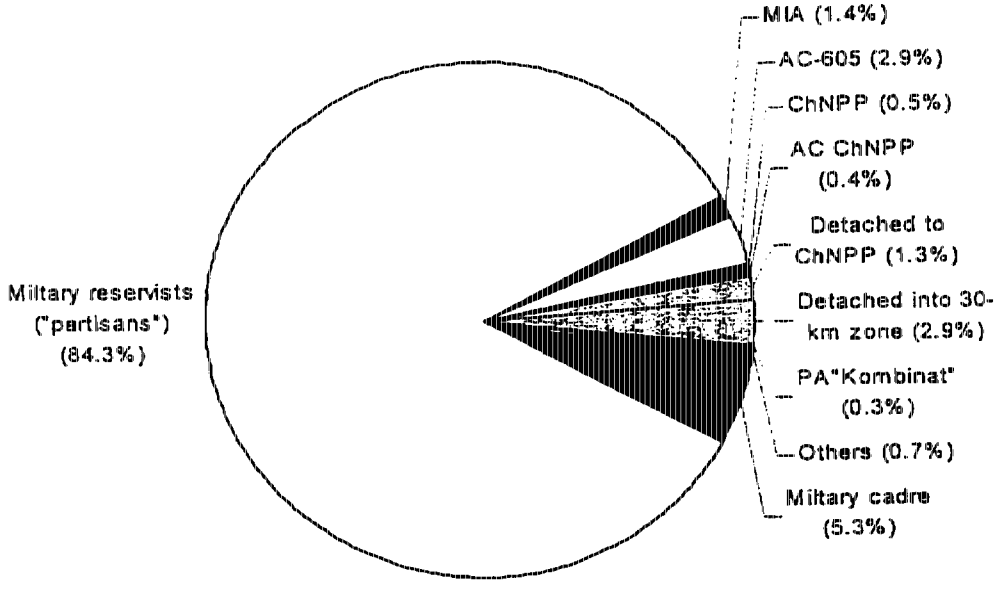


Fig.4. Frequency and cumulative distribution of response receipt vs. time after sending.

The information acquired from the cards was contributed to the database and pre-processed.

It is well known that the cohort of 1986-87 clean-up workers is rather heterogeneous in terms of both type of the work performed during the clean-up and their affiliation. Liquidator's affiliation is of great importance because it reflects different approaches to dosimetric control and planning of exposure doses of the personnel in this period. At least four different departments had their independent dosimetry services: ChNPP, AC-605 (working on "Sarcophagus" construction), PA "Kombinat" (shift-rotated works outside the industrial site), and units of Ministry of Defense. 9 basic types of liquidator's affiliation and an item "others" were distinguished in the questionnaire. Distribution of respondents over these categories has the following form (Fig.5.).



As to the search for the homogeneous groups of liquidators it is interesting to study distribution of the respondents-"partisans" over places of their disposition (see Fig.6).

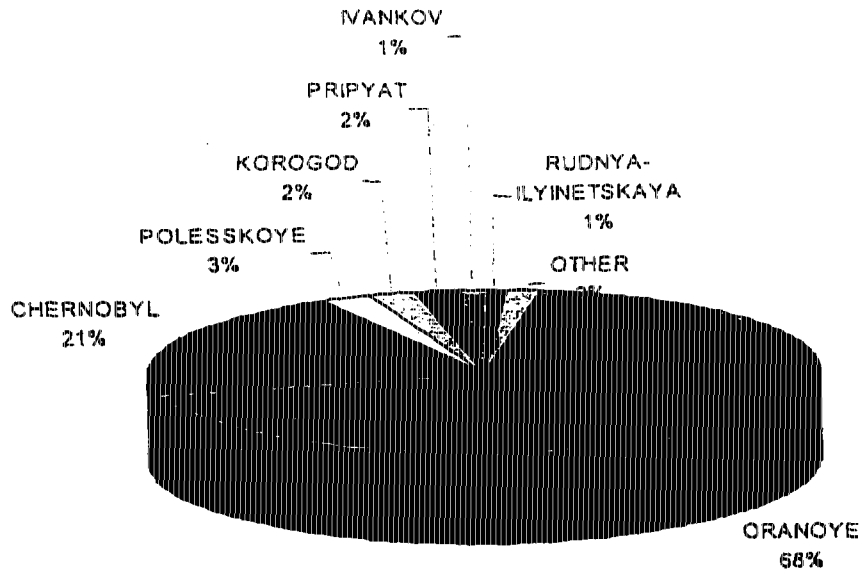


Fig. 6. Distribution of the military reservists ("partisans") over places of their disposition.

According to the Registry data, the largest amount of the military reservists responded to our questionnaire was located in Orane (68%) and Chernobyl (21%), only negligible amount - in Poleske (2%), Prypyat (2%), and other settlements.

While answering the question "Do you know your exposure dose?" a liquidator should select in the card one of the two answers: "yes" or "no". In case of the positive response we allow him to indicate three possible dose values, select one of six methods of dose determination for each dose, and indicate source of information (see the card). Among the total number of 2396 cards, in 336 cases (14%) respondents have not indicated any value of exposure dose.It should be noted that we conducted the survey only among -the persons- who had the dose records in the State Registry. Comparing the first indicated dose value with the Registry record we have found out that in 274 case the discrepancy is greater than 10%. Among them 49 liquidators indicated two or three dose values. Thus, in 9 cases this discrepancy can be explained by the fact that the second or third value in the card agrees with the Registry value within the accuracy of 10% or that the sum of two or three indicated values coincides with the Registry data within 10%.(14 cases). In other 22 cases the first indicated value is liquidator's own overestimation of the dose acquired. For other 225 cases more than 10% discrepancy partially can be explained by errors like 2.5 instead

of 2.05; 25 instead of 2.5, 70 instead of 7; 2.8 instead of 28, but in most cases there is no well-defined reasons for such discrepancies. Therefore, a conclusion can be drawn that in 75% cases the dose value indicated by the respondent differs from the Registry record not more than by 10%.

It should be noted that the survey covered only the liquidators who live in Dnipropetrovsk oblast, hence, the above results and conclusions may not be representative for other liquidators. Unfortunately, the survey in other oblasts of Ukraine, scheduled to be performed in this quarter, has not been performed yet. It may be expected that the results of additional survey of some 4,000 liquidators from several other oblasts of Ukraine may form a basis for - more substantial conclusions as to the types of the works and the dosimetry support of the liquidators included into the State Registry. This will be reflected in the final report on milestone 9.

Milestone 10.
(dosimetric group)

52 residents of Kyiv City and Kyiv Oblast who worked at the industrial site of ChNPP were selected candidates for analytical calculations from among the liquidators (see Table 5). These persons donated teeth to the Bioprobe Bank and have a dose value determined by EPR-method. 26 of them participated in clean-up in 1986, 11 persons - in 1987, and 15 persons - both in 1986 and in 1987. Unfortunately, we have postpone interviewing of the liquidators to the fall of the current year due to objective reasons .

Table 5.

List of the candidates for analytical and biodosimetric dose estimations.

The individuals listed here have a significant privacy interest in this information in order to be free from the false inference that there may be something untoward in their medical history and from possible unwanted solicitations because they are listed here. This list of names contains no information relative to the operations of the agency or the federal government. Accordingly, these names are being withheld.

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Milestone 11.

(dosimetric group)

The studies made during 2-7 months of the Project performance allow to draw some conclusions as to the state of dosimetric interviewing of the liquidators conducted in several organizations.

It was found out that there is no reliable way to obtain information as to the type of the work during clean-up and subsequent reconstruction of the dose other than by compiling a detailed route list certified by responsible persons.

In this way the Research Center for Radiation Medicine, AMS of Ukraine, state enterprise "RADEK" (former Department of Dosimetry Control of Scientific-Production Association "Pripyat"), and Chernobyl Nuclear Power Plant carry out this work. However, only the latter organization carries out intensive investigations on compiling the route list in the interactive mode involving a high-qualified expert-dosimetrist. Preference should be given to this method since it allows to correct doubtful positions of the route list as well as to make immediate changes to clarify type of the work, location and behavior features of a liquidator. Another important aspect is that the expert can get his own impression as to the likelihood of the stated events and reliability of the whole route list.

Both the Consortium questionnaire and the dosimetrical questionnaire of the European group give general information on the time, location and type of a liquidator's work. It is obvious that this information is insufficient to determine individual exposure doses but only allows expert assessment of the possible level (possible range) of doses. It should be noted that the first attempt to involve an expert into dose evaluation using the Consortium questionnaire has not been successful. It was found out that expert assessments tended to overestimate actual doses in case of a low exposure level and underestimate them in case of a high level. These tendencies have completely reasonable explanation as follows: it is impossible to exclude critical (in terms of dose) episodes from general description of the works during clean-up and it results in underestimation of high doses; on the other hand, it is difficult psychologically for the expert to assign a small dose to a person participated in the clean-up in 1986, and so, overestimation of the low doses. Thus, just due to these reasons the expert dose reconstruction is unlikely to be reliable.

Application of much more detailed questionnaire designed by the European group could give positive result but only- in case of using new methods for processing of questionnaires, particularly, the method of "factor estimations" developed by V.P.Kryuchkov Institute of Biophysics, Moscow. It is necessary to note that despite of the fact that the members of the dosimetric group had participated in the discussion and critical analysis of the theoretical developments of this method, its application is far behind the schedule designed during the last –meeting of the International Dosimetric Group in December 1997 in Moscow.

Summing up the findings of the liquidators interviewing we can state that individual dose reconstruction is possible only on the basis of filling in very detailed route lists, preferably with the help of an expert-dosimetrist. Unfortunately, often liquidators cannot recall events in details following 12 years after the accident. This is a natural restriction of application of the route lists method. Questionnaires of general type (like those used in the framework of the Consortium or Estonian study) can't be considered reliable for evaluation of the doses and even dose ranges. The final conclusion as to the feasible application of the more detailed questionnaire of the European group could be done only after complete development of the "factor estimation" method and its testing on a cohort of liquidators with the doses identified by independent sources.

Milestone 13.
(dosimetric group)

As it is known the liquidators - residents of some oblasts of Ukraine recorded to the State Registry will form the cohort for the Project study. Taking into account that the cohort has not been formed so far yet, we have carried out a preliminary search for the persons involved in the State Registry who have or will have in the nearest future information as to the dose value reconstructed using ESR method for toth enamel . Comparing the ESR dosimetry database comprising-398 records of the clean-up workers including information about their dates of birth, home addresses, etc. with that of the State Registry, we have found out of 398 persons only116 (approximately 29%) are registered in the SR .

Milestone 14.
(dosimetric group)

Task 14 has not been performed during this Quarter owing to nondelivery of the necessary EPR equipment by BRUKER Co. However, during the third quarter, Dr. Sergey Sholom, Senior Researcher of the Laboratory of External Exposure Dosimetry, visited USA by agreement between the Project's administration and Applied Dosimetry Center of Utah State University. His visit was aimed at clarification of some new aspects of EPR dosimetry and reconciliation of the joint program of actions in the frameworks of the Project.

Milestone 15.
(dosimetric group)

During the reported period the organization work concerning the retrospective cytogenetic dosimetry with the help of FISH method has been pursued.

The freezer and CO-2 incubator (delayed by the customs so far) as well as some reagents needed for the culture of human peripheral lymphocytes, prepation of fixed pellets, obtaining of human metaphase chromosomes slides from lymphocytes and bone marrow cells, G-banding staining (Histopak, PHA, colchicine, potassium chloride, trypsin, Giemsa stain, Wright stain, potassium phosphate, sodium phosphate) have been obtained.

At the same time we have not received so far the vacutainers, tubes for culturing, tissue culture RPMI 1640, fetal calf serum, slides, the reagents and equipment (particulary, DNA probes, lamp and filtres for luminiscent microscope) needed for the FISH technique.

Milestone 16 .
(dosimetric group)

According to the research plan during the reported period on milestone 16 the cytogenetic examination of liquidators with different dose exposures has been pursued.

During Quarter III blood samples from 12 persons - representatives of different groups of liquidators have been examined -From 3 patients treated at the department of radiation pathology and recovered after the acute radiation sickness (ARS) with different exposure degrees (1 person with II degree), (2 persons with III degree) in accord with the official documents: 2.2; 5.5 and 5.7 Gy, respectively.

-from 5 patients treated at the hematologic department (headed by Dr. Klimenko);

-from 4 persons examined at the laboratory of external radiation dosimetry (headed by Dr. Chumak) .

All blood samples have been cultivated during 48 hours according to the standard protocol adopted in the cytogenetic lab of RCRM; the fixed sediments of peripheral lymphocytes have been received, from the part of which the metaphase chromosome slides ready for fluorescence in situ hybridization using directly labeled DNA-probes have been obtained.

On the whole, during Quarters II and III in the framework of milestone 16 the fixed pellets from 2 4 persons have been received - from 10 patients recovered after ARS with the dose exposure from 1.8 to 5.5 Gy; from 8 patients with dose exposure from 0.5 to 1.9 Gy from hematologic department; from 6 persons (liquidators) with the dose exposure from 18.6 to 34.5 cGy. examined with the help of EPR All the sediments and slides are stored in the freezer at - 18 C.

(hematologic group)

In Quarters I and II peripheral blood from 4 healthy individualds exposed to the dose in excess of 0.5 Gy was collected. In Quarter III peripheral blood from 4 healthy individuals with different doses of exposures (from 0.2 to 1 Gy) was collected and transferred to the biodosimetric laboratory for FISHT analysis .

Milestone 17

(dosimetric group)

In accord with the working plan of Quarter III, blood and bone marrow samples had been obtained from two patients with acute lymphoblastic leukemia and chronic

myeloid leukemia treated at the hematologic department of RCRM. The pellets of fixed cells and partly G-banded methaphase chromosome slides were prepared.

On the whole, during Quarters II and III in the framework of milestone 17 the fixed pellets from 4 persons have been received.

Milestone 18

(dosimetric group)

The laboratory of external exposure dosimetry pursued to collect, registrate, and preliminary process the teeth samples as well as contribute data to the Bioprobe Bank.

During Quarter III 160 teeth samples from the clean-up workers were collected. Among them 58 bioprobes were received from Kyiv City and Kyiv Oblast, 30 from Kharkiv, 18 from Zaporizhzhya, and 18 from Poltava Oblasts.

(hematologic group)

In Quarters I and II of the pilot phase of the Project biological materials from 4 patients with leukopenia and thrombocytopenia, from 4 patients with myelodysplastic syndrome, from 4 patiens with leukemia (2 with chronic lymphocytic leukemia, 2 with acute leukemia) and 2 with non-Hodgkin's malignant lymphoma had been stored..

In Quarter III the the biological tissues from 2 patients with myelodisplastic syndrome, 2 with leukemia (1 with acute leukemia and 1 with chronic lymphocytic leukemia) were stored for long-term retention in the low-temperature refrigerator at -70 C for molecular investigations in the future. Among them 3 are clean-up workers, 1 was evacuated from the 30-km. zone. All the materials were obtained prior to the therapy.

A consent was obtained from 2 patients with acute and chronic leukemias to provide teeth.

TASK 3: LEUKEMIA AND LYMPHOMA

Milestone 20.

(epidemiologic and hematologic groups)

During Quarter III a search has been carried out and preliminary review done of leukemia-lymphoma in the clean-up workers registered in the State Registry in Dnipropetrovsk during 1990-1995.

The State Registry, hematologic department of the city hospital No.4 (Dnipropetrovsk city), oblast dispensary department for medical support of the Chernobyl victims (Dnipropetrovsk city) were the sources of information.

The period under study during quarter III encompassed 1990-1995.

Sampling of the persons diagnosed with leukemia or malignant lymphoma in accord with the data of the routine physical examinations during 1990-1995 was performed in State Registry DB. Subsequently , a preliminary review was done involving inspection of medical records (clinic logs, case histories) and filling- in the standard form designed at the RCRM by a group of epidemiologists and hematologists to study hematologic diseases among the population suffered.Partially, the information is stored in the form of short extracts from the patients' medical records. All information collected on the paper media is being analysed by a group of the hematologists to specify the category of the diagnosis accuracy (diagnosis is definite, diagnosis is probable, diagnosis is possible, diagnosis is rejected). Such review can't be considered a final one since it was performed only basing on the analysis of patients' medical records without examining biological materials samples. Nevetherless, the results of the review may be definitely considered reliable since the records were done basing on the data of the patients' physical examinations in specilized institutions having vast experience in diagnosing and treatment of the oncological blood diseases.

In some cases liquidator's disease detected during routine physical examinations was incorrectly coded by medical personnel to transfer the data to oblast State Registry. As a result, sometimes false-positive cases of leukemia were ascertained.

The diagnoses were rejected and they will not be further taken into consideration. The feasibility to solve problems of the false-negative cases will be examined by the hematologists involving epidemiologists while performing milestone 23 of the Protocol.

Another way of acquiring data on leukemia -lymphom cases among liquidators was a search in the oblast medical institutions mentioned above to gain any information on participation in the emergency zone.

In this case the diagnostic information was in the form of detailed extracts from the patients' medical records. For this, both methods were used involving active (field work of the RCRM specialists) and passive ones (making arrangements with the local personnel).

The data gained were preliminary reviewed by the hematologists of the RCRM followed by the linkage of the patients' passport data with the Registry ones to ascertain whether the liquidator is registered in the State Registry.

The results of the studies during quarters II- III are presented in Table 6.

Table 6.

The results of the preliminary review of the leukemia-lymphoma ascertained in the male liquidators residents of Dnipropetrovsk oblast in 1987-1995.

The results of the preliminary review	Registration in the State Registry		
	Registed	Non registered	Total
Diagnosis is definite	6	1	7
Diagnosis is probable	6	1	7
Diagnosis is possible	1	1	2
Total	13	3	16

This study was focused on the cases of the definite and probable diagnoses in the persons registered in the State Registry. During the period under the study 12 cases were ascertained. Their distribution according to the age and diagnosis groups is shown in Table 7.

Table 7

Distribution according to the age of the of the leukemia cases (diagnosis is definite or probable)in the male liquidators registed in the State Registry (1987-1995)

Group of diseases	Age group (at the moment of the diseasis onset)					
	20 - 29	30 – 39	40 - 49	50 - 59	60-69	20 – 69
Malignant lymphoma	2	0	1	2	0	5
Multiple myeloma	0	0	0	0	0	0
Leukemia	2	1	3	0	1	7
Total	4	1	4	2	1	12

Thus, during the period under study no case of multiple myeloma was ascertained. As it is seen the highest absolute number of leukemia and lymphoma cases was ascertained in the age groups of 20-29 (4 cases) and 40-49 (4 cases) at the moment of the disease onset.

Milestone 22.

(epidemiologic and hematologic groups)

Collective discussion was held of the technique to perform review involving selection of diseases for it. Dr.Stuart C.Finch, Dr.Gilbert W. Beebe, Dr.Geoffrey R.Howe, Dr. David Burch, Dr.Victor I.Klimenko, Dr.Irina S. Dyagil, Dr. Natalia A.Gudzenko took part in the discussion. The final variant of the procedure is being discussed.

As for the selection of the cases for review the random sample will be chosen from all the patients diagnosed in 1987-1997 in all oblasts included in Phase II of the study. The oblasts are: Dnipropetrovsk, Donetsk, Kharkiv, Sumy, Kyiv oblast and Kyiv city. The epidemiologic group will proceed as soon as possible to obtain lists of both deceased and alive cases of leukemia and lymphoma diagnosed in the above listed study areas in order to

subsequently choose from each area a random sample (based on different diagnostic categories among male cases in the defined age group of 20 years old to 40 years old at the time of the Chernobyl accident).The sample will be chosen from lists of all cases diagnosed kept by central oblast, oncology dispensary or city hospital.

For the purposes of the pilot diagnostic review it was determined that the most appropriate source in terms of the basic goals of the review and its expedition are:

a) for leukemia and related diseases the hematology department/outpatient clinics of the oblast hospital and/or the city hospital for that oblast.

b) for lymphomas the most appropriate source will be the oncology dispensary for each oblast.

The reasons for such decision were as follows. In accordance with the organization of medical services in Ukraine all patients who are suspected of having leukemia or lymphoma are directed by their physicians to the hematologic department of either the oblast or city hospital. In the case of treatment for patients with suspected leukemia who are subsequently confirmed to have leukemia all will have medical treatment at the hematologic departments. Therefore, all medical records and biological samples for the leukemia cases are stored in these departments.

It is important to state that the general population of Ukraine who are suspected as having leukemia and/or lymphomas and subsequently confirmed with these diagnoses are not treated in any way differently than those with leukemia/lymphoma diagnosed and treated within the Chernobyl victim population.

The procedure to follow in obtaining case lists is as follows. The lists of cases diagnosed retrospectively with leukemia/lymphoma are in the form of journals which list such cases by year of registration. Each such journal contains at a minimum the case's full name, gender, year of birth, and diagnosis.

The random group for the review will involve the required number of cases diagnosed with leukemia. The number of required cases in each sub-classification was determined by Dr. Finch together with Drs. Dyagil and Klimenko to expedite an adequate diagnostic review to assess the availability of clinical records and biological materials together with the ability to confirm the diagnoses of leukemia and lymphomas made previously from 1987 to 1997. The number required for the diagnosic review is as follows: 2 cases of chronic myelogenous leukemiaa, 1-2 cases of chronic lymphoidd leukemia. 5 cases

of acute leukemia, 2 cases of leukemia-related disorders (i.e. myelodysplasia, myelofibrosis, polycythemia vera, thrombocythemia, etc.), 3 cases of non-Hodgkin's lymphoma, 2 cases of Hodgkin's disease and 1 case of multiple myeloma.

The sample for the review will be restricted to only males born between the years of 1946 and 1966. This will limit the sample to the group 20-40 years of age at the time of the Chernobyl accident and thus, enable us to focus on the confirmation of leukemiaa/lymphoma in adult males. We have chosen only males because Phase II of the study is of course limited to male liquidators.

It is anticipated that the cases will be chosen randomly in each oblast from the journals using lists of random numbers corresponding to the years 1987, 1988, etc. up to 1997 and institution of diagnosing. At first it was planned to use lists of random numbers to select year of the disease onset and journal page for this year. As the experience showed the registrating journals contain different number of pages and involve information on several years which makes the search difficult therefore, it is worthwhile to use the list of the cases and select randomly year and month of the disease onset.

During quarter III a search and sampling for review in Dnipropetrovsk oblast have been carried out.

The cases of leukemia were selected in the journals of the patients registration in the hematologic department of Dnipropetrovsk city hospital No. 4 using list of random numbers to choose year and month of the disease onset.

The journals for patient registration are replaced after their filling in rather than every year, and contain the information as follows: surname, name, patronimic, age (full years), home address of the patient, No.of his case history,diagnosis, time period of his stay in the hematologic department (data of hospitalization and discharge), data of death. For the review 2 cases of chronic myelogenous leukemia, 1 case of chronic lymphoid leukemia, 5 cases of acute leukemia, 2 cases of related diseases (myelofibrosis), 1 case of multiple myeloma have been chosen.

Cases of malignant lymphoma have been selected in the oblast oncological dispensary (Dnipropetrovsk city) using the DB of the Cancer Registry maintained here. The Cancer Registry involve all information on malignant tumors ascertained in the residents of Dnipropetrovsk oblast since late 50s. According to the specialists of the Cancer Registry the information on leukemia can't be considered complete. As for the forms of

malignant tumors the Cancer Registry is the source of the most complete data on oncological diseases in Dnipropetrovsk oblast. All the information involved in the DB is also stored on paper media.

To select lymphoma cases the list of random numbers was used for choosing year of diseasis. Using DB the first patient was selected from the alphabetic list with the appropriate year of the disease onset, gender and age.

In this way 3 cases of non-Hodgkin's lymphoma and 2 cases of Hodgkin's lymphoma have been selected.

The list of the cases selected for the review along with the list of the required for each case materials were transfered to the hematologist of the city hospital No. 4 who is responsible for the Protocol performance in Dnipropetrovsk oblast.

The materials for the review must involve all the available medical records of a patient, all the available samples of peripheral blood, bone marrow, bio- and autopsy including samples for cytochemical analysis desirably, prior to the therapyt. The material should be complete, if possible.

The materials collected in the oblat will be transferred to the hematologic department of RCRM (Kyiv) to the responsible person with the report drawn on the transfer for all cases concurrently. The form of marking will be agreed prior to the transfer to Kyiv. The system of indentification will be elaborated by the epidemiologic and hematologic groups.

The materials are to be returned as soon as demanded by the local personnel in the initial state.

Upon receiving materials from all 5 oblasts planned and Kyiv city the necessary organization of medical records and biomaterials samples and their preparation for the review will be performed.

Milestone 23.

(hematologic group)

During Quarters I and II of the pilot phase of the Project other hematologic diseases (leukemia, myelodysplasia, polycytemia vera, essential thrombocytemia, aplastic or hypoplastic anemia, multiple myeloma, myelofibrosis, various lymphoma) were studied at the hematologic departmcnt of the city hospital No. 4 of Dnipropetrivsk where the

majority of the urban and rural patients with leukemia and lymphoma are treated. Victims of the Chernobyl accident are also treated there.

During Quarters I and II the medical records of patients - residents of Dnipropetrovsk in 1987 and 1988 were analysed.

It should be noted that in accord with the analysis the majority of the cases were with chronic lymphocytic leukemia. It is likely to be the result of the incorrect involvement of some cases of the non-Hodgkin's lymphoma in the list. Such cases are to be additionally reviewed by experienced hematologists and pathologists.

During Quarter III an analysis was made of the distribution of the leukemias and lymphomas morbidity in 1990 among the patients-residents of the Dnipropetrovsk oblast and Dnipropetrovsk city of the newly-diagnosed cases as follows:

acute leukemia - 98;
chronic lymphocytic leukemia - 138;
chronic myelogenous leukemia - 34;
chronic myelomonocytic leukemia - 2;
multiple myeloma - 48;
policytemia vera - 22;
subleukemic myeloid leukemia - 19;
aplastic anemia - 8;
malignant lymphoma - 124.

The results of the analysis showed that in 1990 among the patients of this region the chronic lymphocytic leukemia proved to be predominant in the structure of the morbidity. A great number of the multiple myeloma was noteworthy. At the same time the number of the patients with acute leukemia was 98, with malignant lymphoma-124. No case of the disease in the stage of leukemization was revealed. Only 2 cases of myelodysplastic syndrome was detected which is due to the fact that at that time FAB-classification was not employed.

Milestone 24.

(hematologic group)

Field works in the Donetsk, Kharkiv, Sumy, Kyiv oblasts and Kyiv city were planned to familiarize the leading hematologists of these oblasts with the Protocol of the Leukemia-Lymphoma Programme.

During the field work in Sumy Drs. I.Dyagil and V.Klimenko got acquainted with the state of the hematologic service in the oblast on the whole, with the functioning of the local Registry, with the follow-up and treatment of the Chernobyl victims. The hematologists of the oblast were informed on the Pilot Project and tasks of the Project Phase II. Medical records and some slides were looked through for quality control.

TASK IV: MOLECULAR BIOLOGY

Milestone 26

(hematologic group)

In accord with the tasks for Quarter I and II peripheral blood was taken from 17 highly exposed persons for the hematologic analysis involving routine blood analysis with count of the number of erythrocytes, leucytes, platelets, level of hemoglobin, hemogram, etc. The blood from 4 persons was processed with separation of erythrocytes and mononuclear fractions for the long-term storage.

In Quarter III 2 patients with the dose exposure in excess of 0.5Gy were examined. Peripheral blood was removed, processed with separation of the mononuclear fraction to store in the low-temperature refrigerator at -70 C at the hematologic department.

For the time being storage of the erythrocyte fraction is impossible because of the lack of the reagents necessary for this procedure.

Milestone 27.

(hematologic group)

During Quarters I and II three patients were examined (1 with chronic myeloid leukemia, 1 with non-Hodgkin's malignant lymphoma and one with myelodysplasic syndrome).

The peripheral blood and the bone marrow removed from the patients are processed in accord with the Appendix 3.

In Quarter III a patient D. with malignant lymphoma at the leukemization stage was revealed in the Dnipropetrovsk oblast. The patient was transferred from Dnipropetrovsk city to the hematologic department of the Institute for Clinical Radiology. The examinations involved morphological analysis of the peripheral blood and bone marrow, cytochemical investigation, immunophenotyping of the peripheral blood and bone marrow and hystological investigation of the lymph node. The bone marrow samples were stored for long-term retention. Furthermore, the lymph node sample in formaline solution was stored.

In Quarter III the biological material from 2 patients with myelodysplastic syndrome and 2 with leukemia (1 with acute leukemia and 1with chronic lymphocytic leukemia) were stored for long-term keeping.

Milestone 29.

(hematologic group)

In Quarter II of the Project Pilot phase an attempt was made to get in touch with the authorities of the Registry of the Ministry of Internal Affairs of Ukraine. An enquiry was formulated to the authorities of this Registry as to the feasibility to receive information on the individuals with the dose exposure in excess of 0.5 Gy.

An access to the medical records of the Republican specialized dispansary for the population protection was obtained.

In Quarter III the work proceeded to detect the individuals with the dose exposure more than 0.5Gy. 78 persons with dose exposure from 0.5 to 1 Gy were revealed. The file is created to input data on all the high-dose persons.

Data linkage with the State Registry of Ukraine is performed concerning the persons with dose exposure in excess of 0.5Gy.

A search for other sources of information as to the high-dose persons is being pursued.

Milestone 30.

(hematologic group)

An operational manual is designed for the control subcohorts examination (20 persons) involving informed consent for the interview, filling-in the questionnaire, procedure of bleeding, blood quantity, its processing and transfer to Kyiv. The manual will be put into operation in Quarter IV.

(epidemiologic group)

In Quarter III 20 persons randomly selected from the State Regisrty DB were planned to be asked for interview. While this the following criteria should be satisfied:

- they must be residents of Dnipropetrovsk oblast;
- they had rroutine physical examinations in 1997 (with the code coupon data available);

- they are alive according to 1997 data.

In Quarter III the liquidators were asked for interview by the responsible physician of the regional outpatient clinics personally by telephone or home visits. It was anticipated that such invitation is perceived better than the written one. The physicians asked liquidators in the agreed form. The liquidator was briefly explained the purpose of the study and the interview, the name and occupation of the interviewer, request to participate in the study at the appropriate for the liquidator time.

The interview was held at the Dnipropetrovsk oblast hospital No.4 by the head of the dispensary department for medical support of the victims Chekmareva T.I. She had been specially trained at the seminar in April 1997 in Kyiv (WHO; NCI; RCRM).

From among 20 persons asked for the interview :

- 9 were interviewed at the agreed time;
- 2 persons emigrated to Russia (Dec.11, 1997 and Febr.14, 1998);
- 1 person is an alcogolic therefore, the contact with him proved difficult;
- 1 person refused to participate without motivation;
- 1 person refused to participate in the interview because of some business reasons, personally informed about it the interviewer. He is likely to be interviewed later on;
- 6 persons haven't appeared at the agreed time.

While analysing the interview's findings it should be noted that from among 20 persons 4 persons proved to be inaccessible, i.e. 20 % of the total number. 7 persons may be potentially interviewed. 9 persons (45 %) took part in the interview at the agreed time, the questionnaire being filled in.

To organize subsequent interviews it was decided to sent familarizing letters to the liquidators selected for the interview to invite them for participation in the study. Moreover, the liquidators will be asked by the responsible physician personally by telephone contact or home visits.

The text of the familarizing letter is given below.